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Takechi

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(54) **GOLF CLUB HEAD**

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This patent is subject to a terminal disclaimer.

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A63B 59/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A63B 53/047*** (2013.01); *A63B 53/0466* (2013.01); *A63B 2053/0491* (2013.01); *A63B 59/0092* (2013.01)
USPC **473/332**; 473/335; 473/338; 473/342; 473/350

(58) **Field of Classification Search**
USPC 473/324–350, 287–292
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,163,091	A *	6/1939	Held	473/338
5,316,298	A	5/1994	Hutin et al.	
6,659,883	B2 *	12/2003	Nelson et al.	473/324
7,004,852	B2 *	2/2006	Billings	473/332
7,384,348	B2 *	6/2008	Lin et al.	473/332
7,621,822	B2 *	11/2009	Roach	473/329
7,637,823	B2 *	12/2009	Shimazaki et al.	473/332
7,749,100	B2 *	7/2010	Tavares et al.	473/332
7,775,904	B2 *	8/2010	Hirano	473/332
8,267,807	B2 *	9/2012	Takechi et al.	473/332
8,449,408	B2 *	5/2013	Clausen et al.	473/335
2007/0129160	A1 *	6/2007	Matsunaga et al.	473/332

FOREIGN PATENT DOCUMENTS

JP	6-510689	A	12/1994
JP	2011-030837	A	2/2011

* cited by examiner

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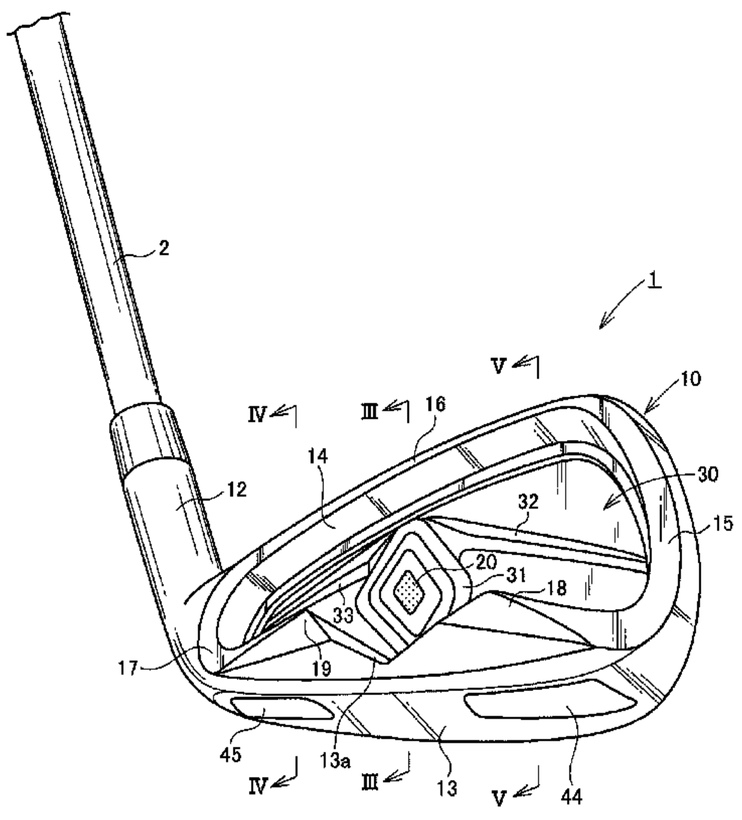
(57) **ABSTRACT**

A golf club head of an iron type includes a face plate part for hitting a ball, which has a cavity part on the back side thereof; a sole part; a hosel part for connecting the head to a shaft; a viscoelastic body made to adhere to the back face of the face plate part, the viscoelastic body including a board-shaped part located on the back face of a central portion of the face plate part and extending parts extending from the board-shaped part to the toe side and the heel side of the head; and a cover plate lapping over the viscoelastic body, the cover plate including a concavity for accommodating the board-shaped part of the viscoelastic body and concave lines for accommodating the extending parts of the viscoelastic body. The cover plate has an opening, and a part of the viscoelastic body is exposed through the opening.

6 Claims, 8 Drawing Sheets



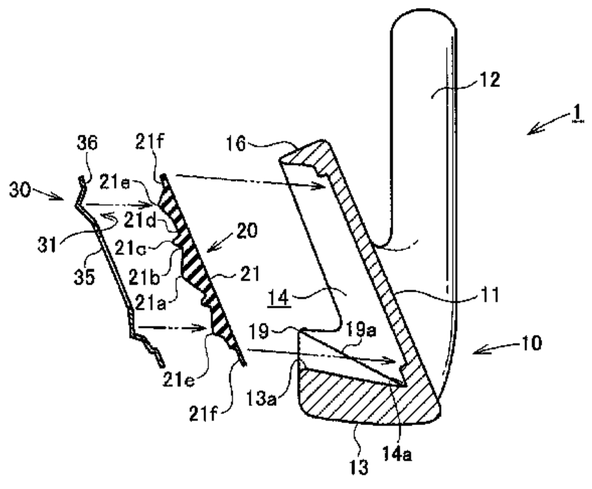


FIG.1

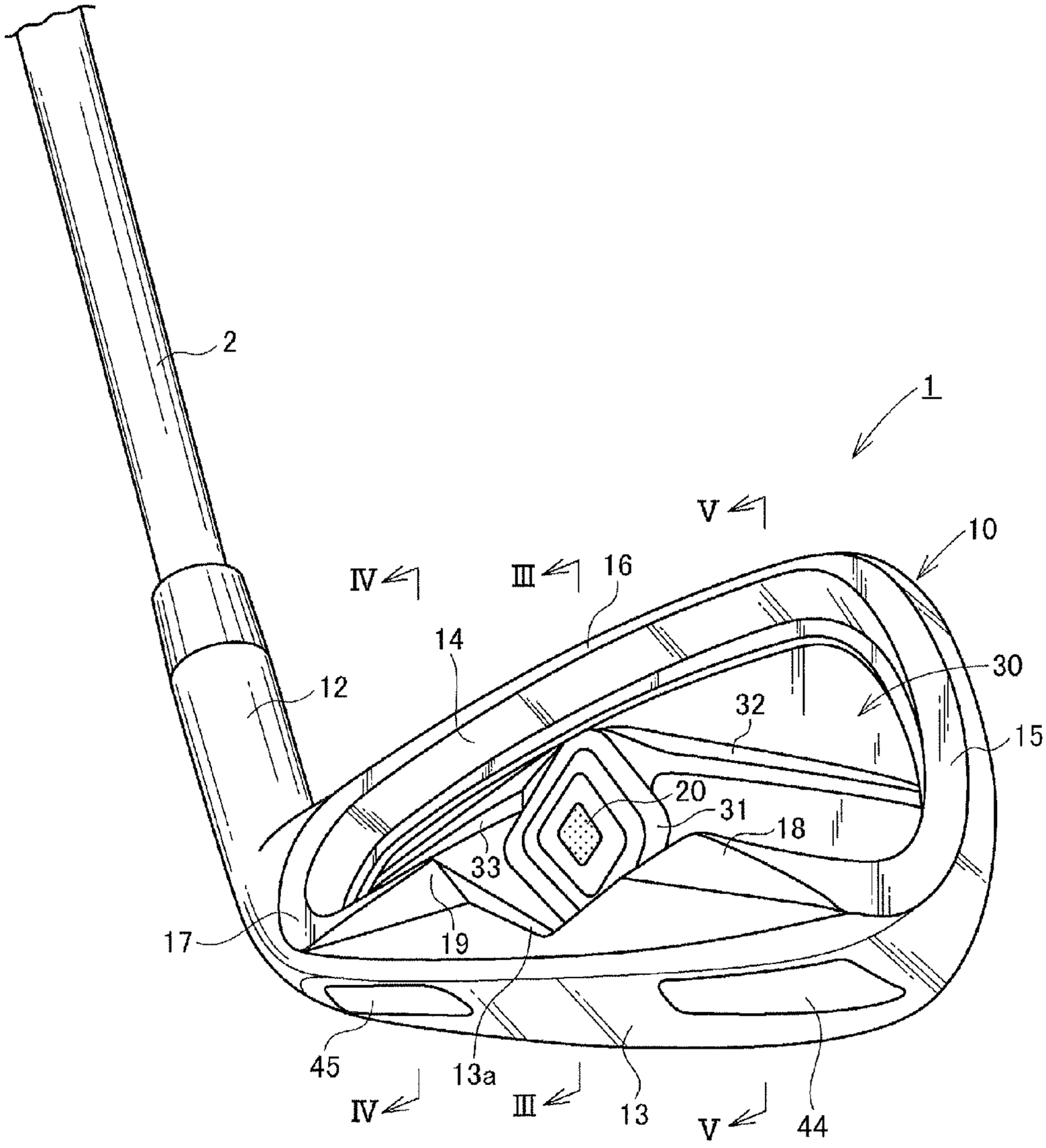


FIG.2

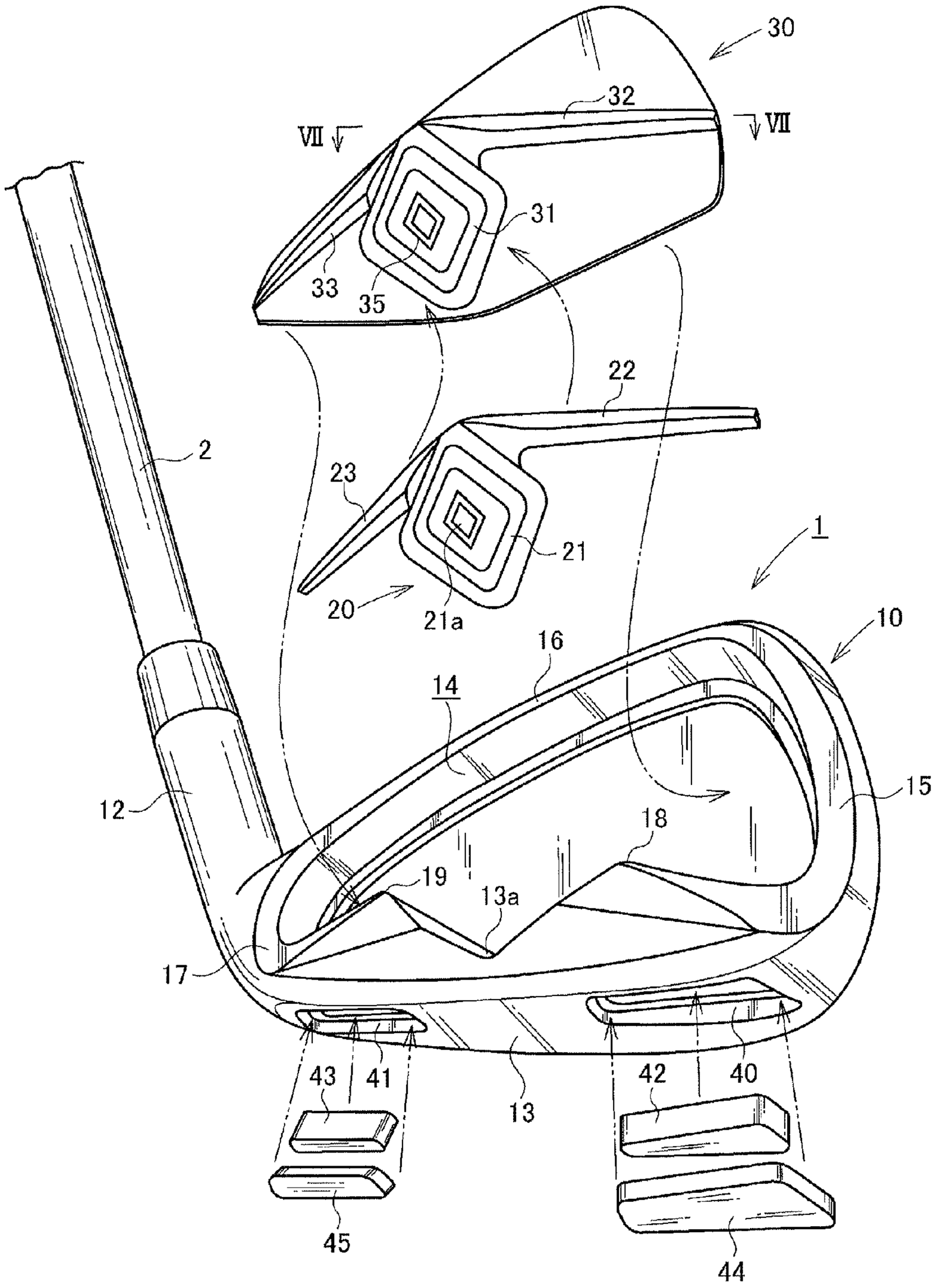

30
32
VII
VII
31
33
35
22
2
23
21
1
20
21a
10
16
14
12
15
18
19
13a
17
43
41
13
42
40
45
44

FIG.3

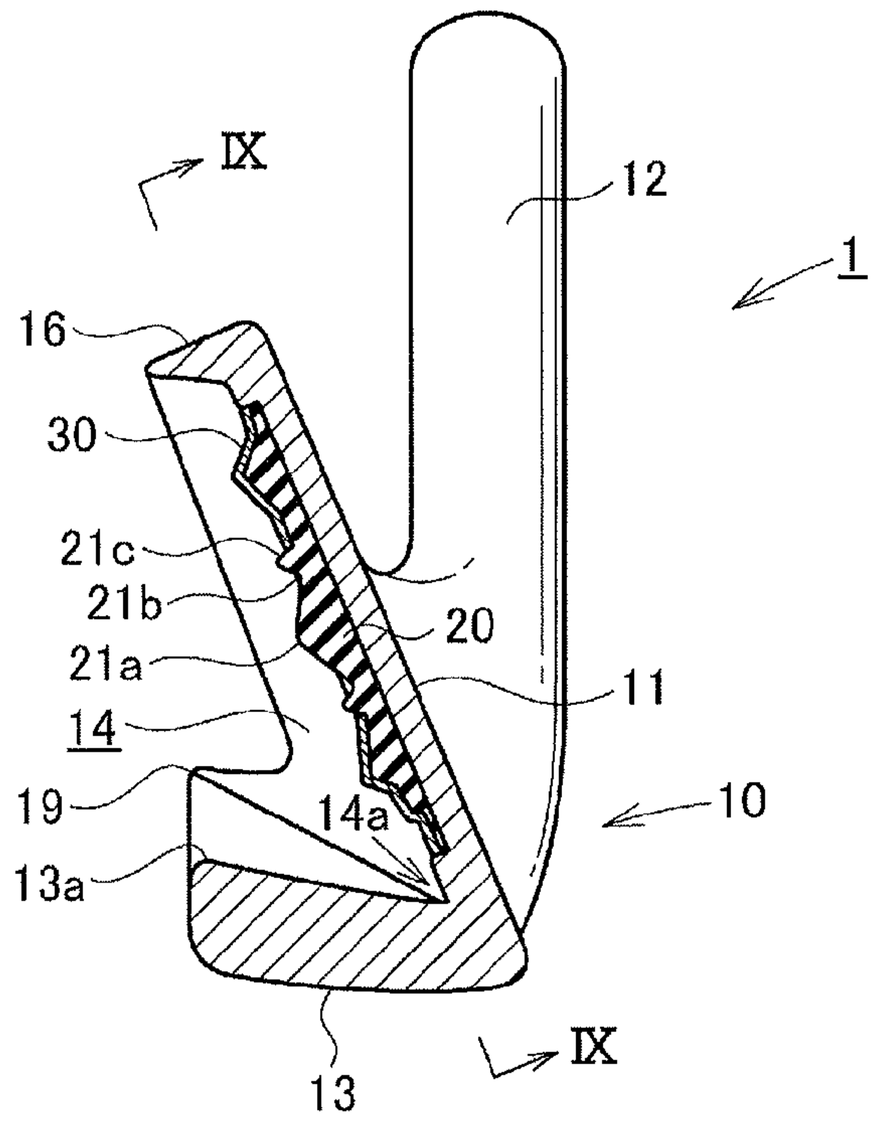

IX
12
1
16
30
21c
21b
20
21a
11
14
19
14a
10
13a
IX
13

FIG.4

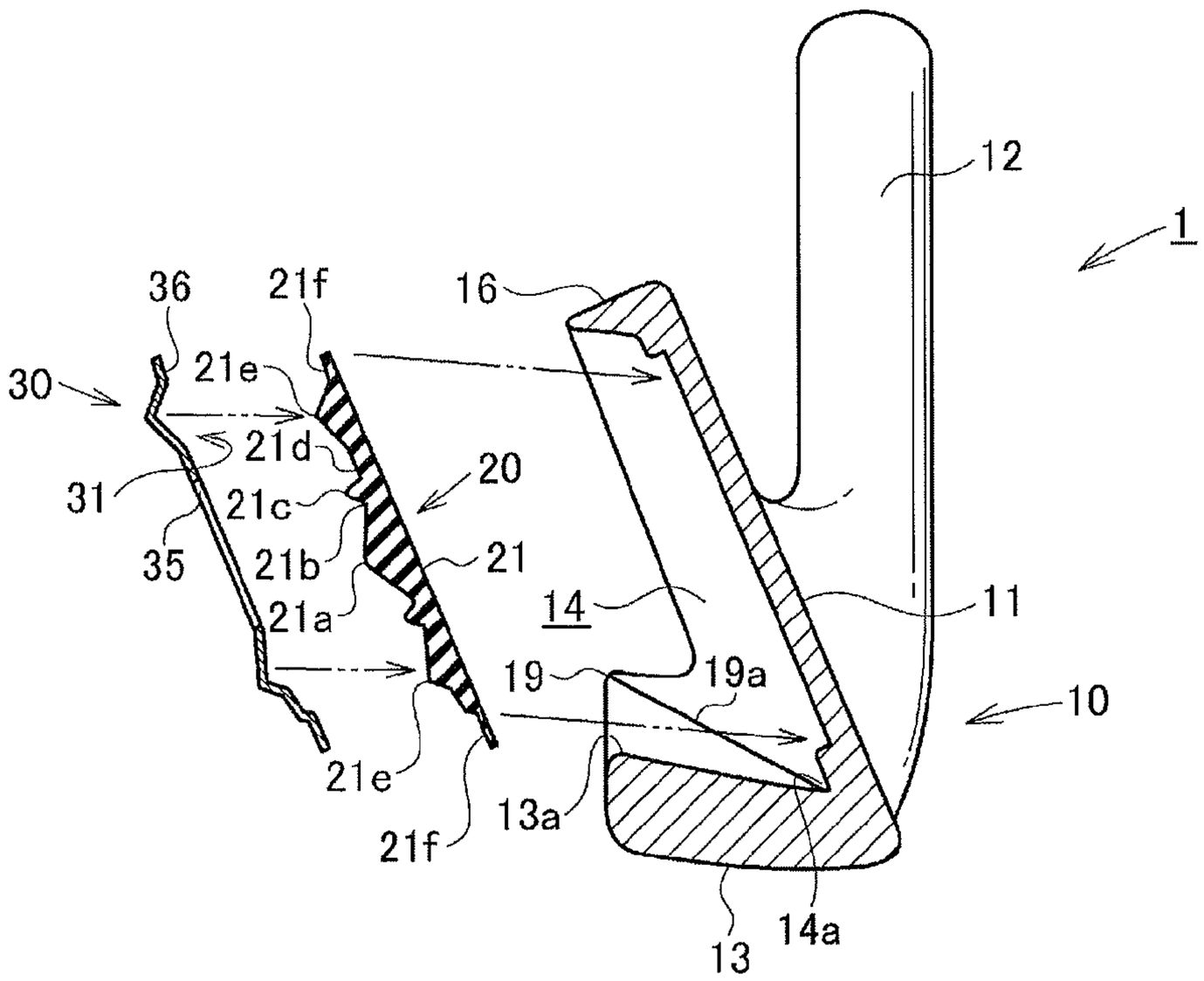
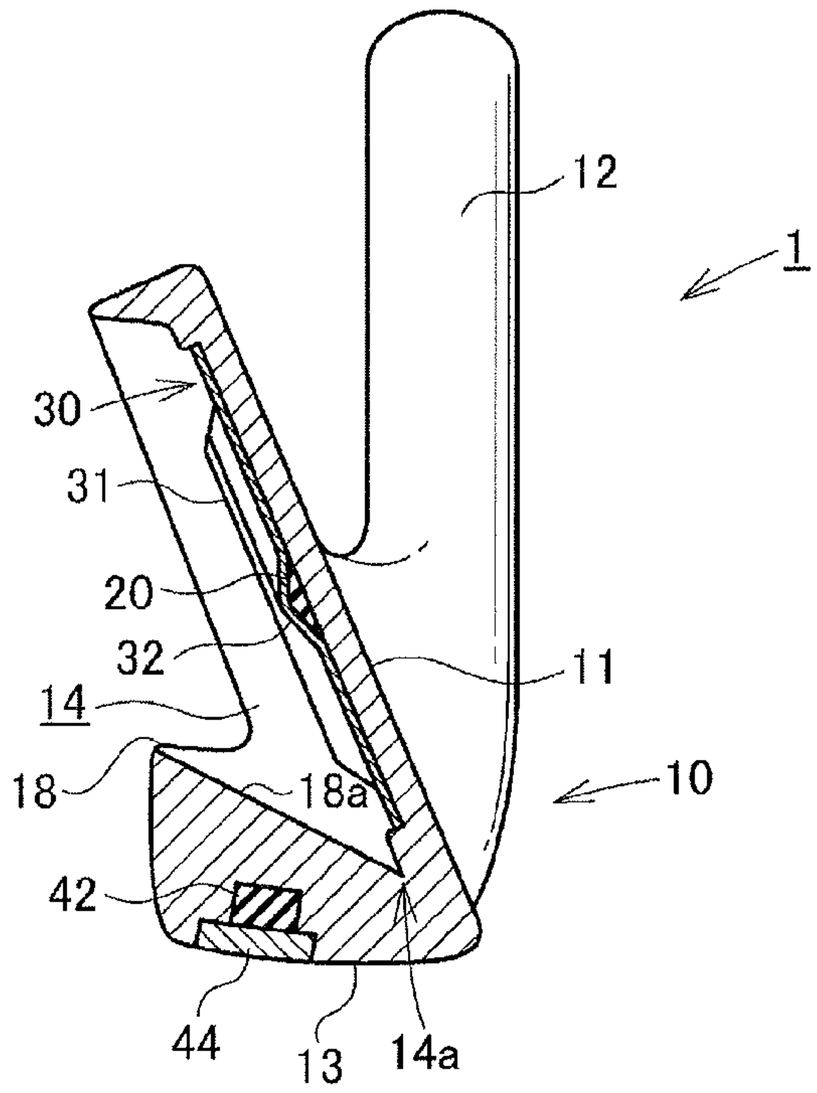

12
1
36
21f
16
30
21e
21d
20
31
21c
21
35
21b
21a
14
11
19
19a
10
21e
21f
13a
13
14a

FIG.5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1
30
31
20
32
11
14
18
18a
10
42
44
13
14a

FIG.6

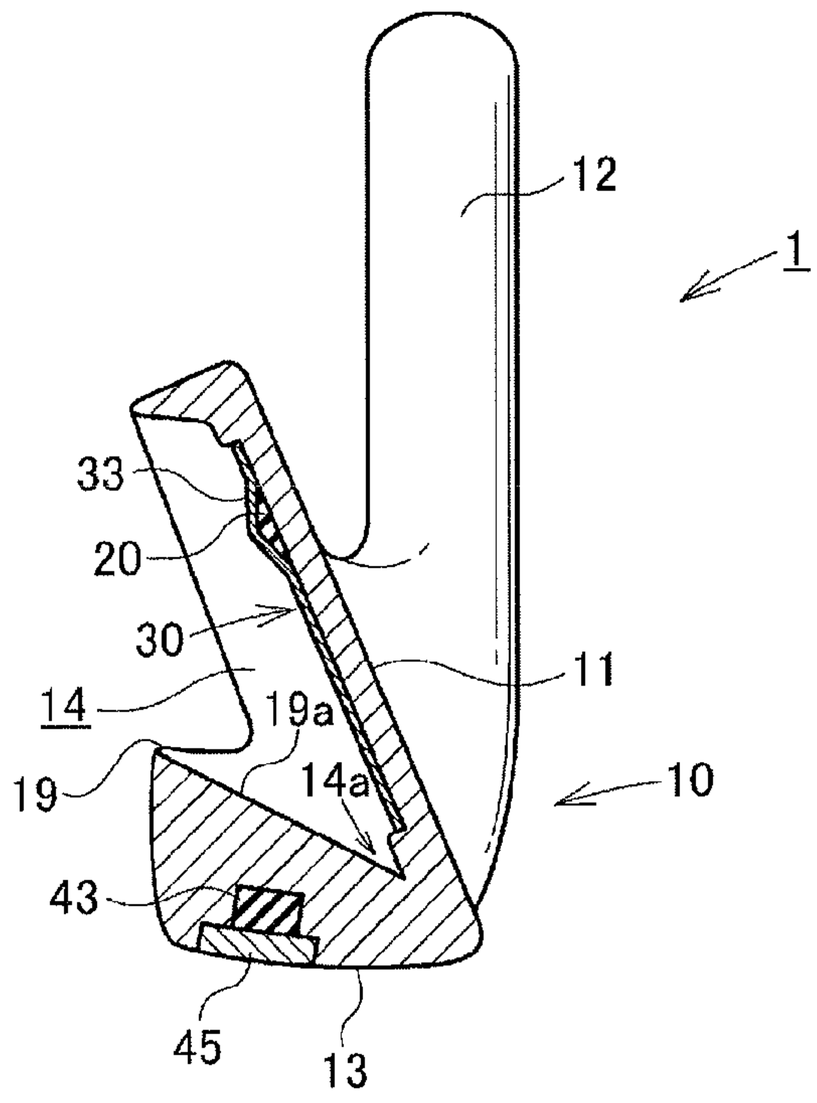

12
1
33
20
30
11
14
19a
19
14a
10
43
45
13

FIG.7

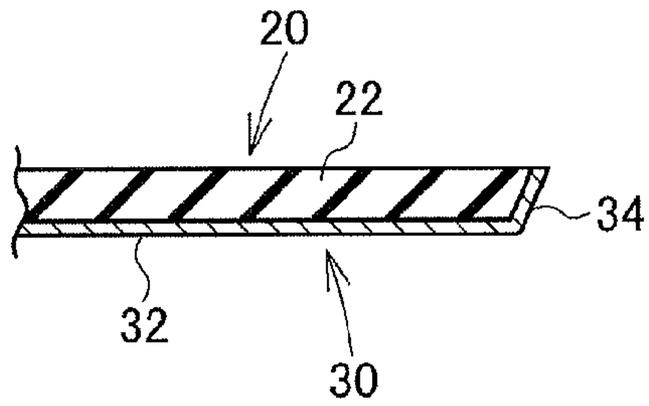


FIG.8

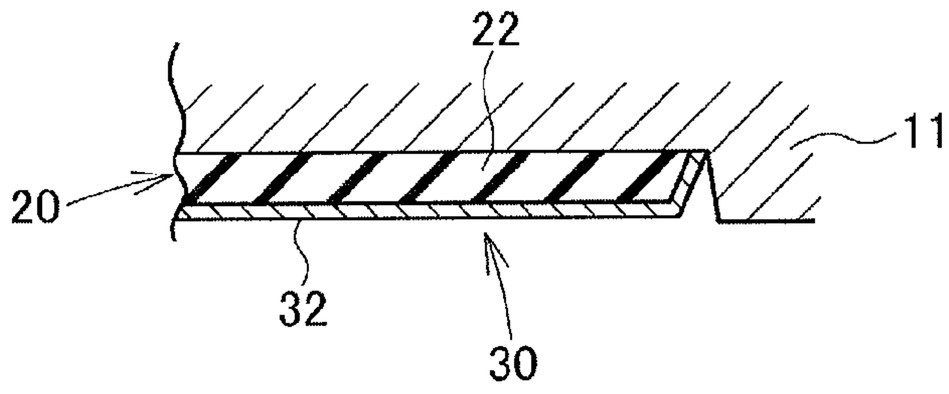


FIG.9

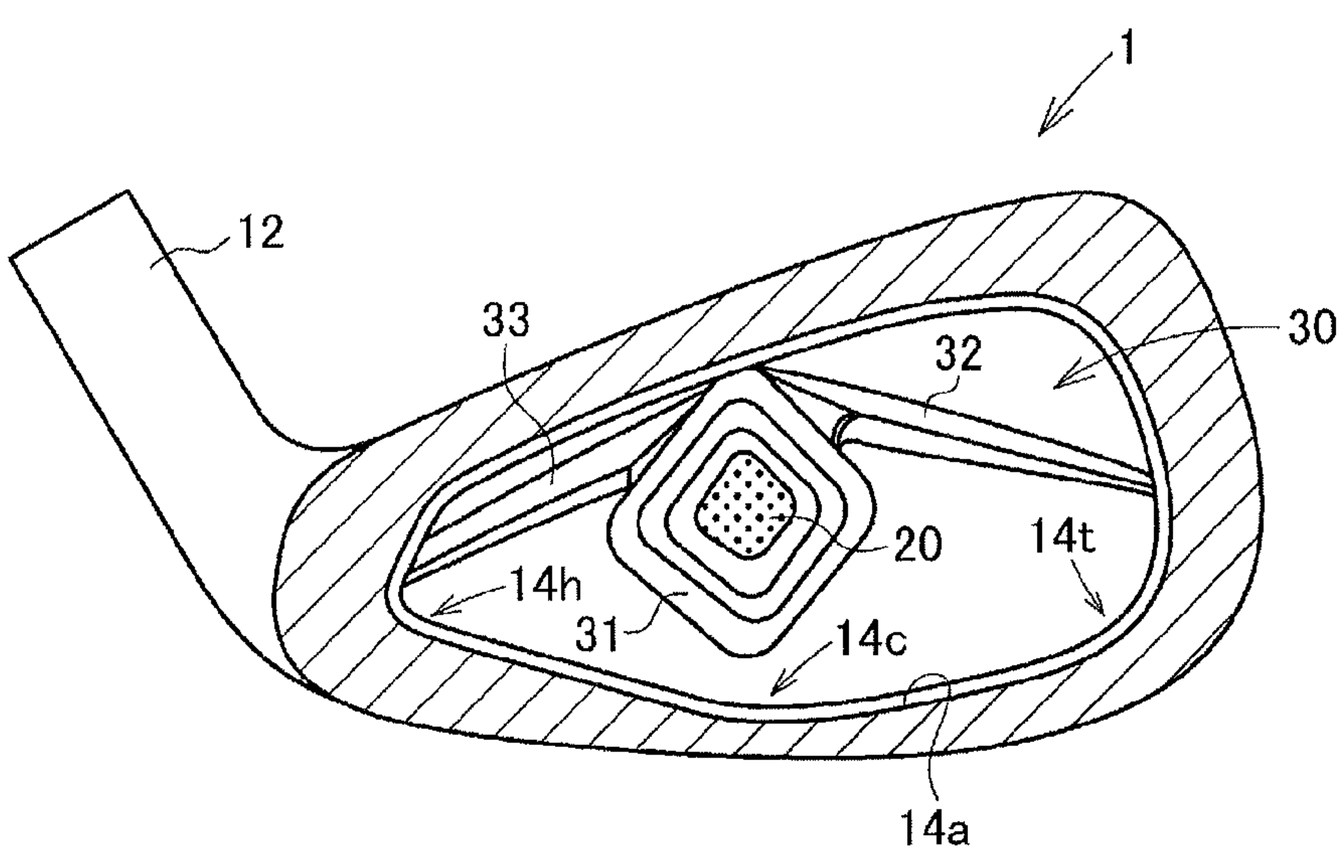


FIG.10

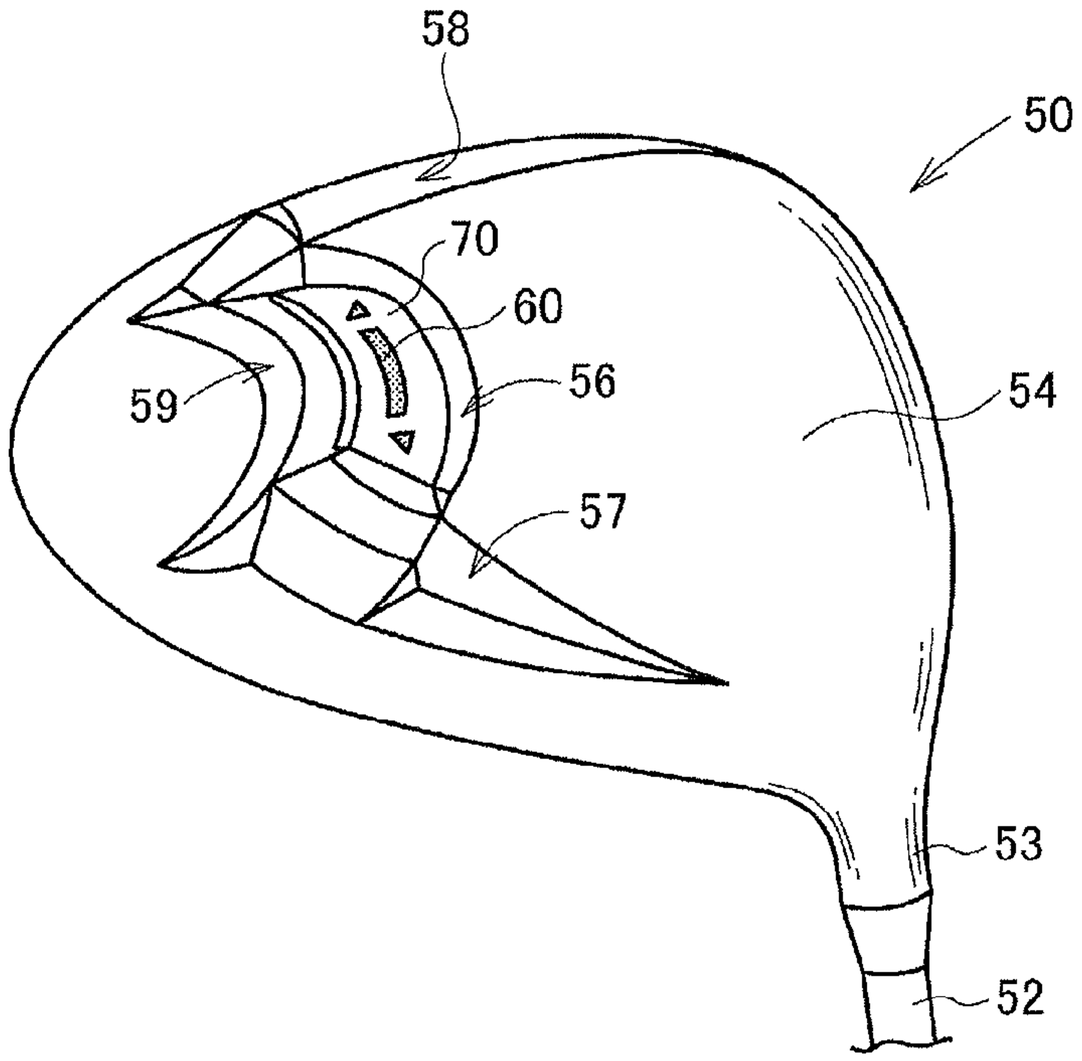


FIG.11

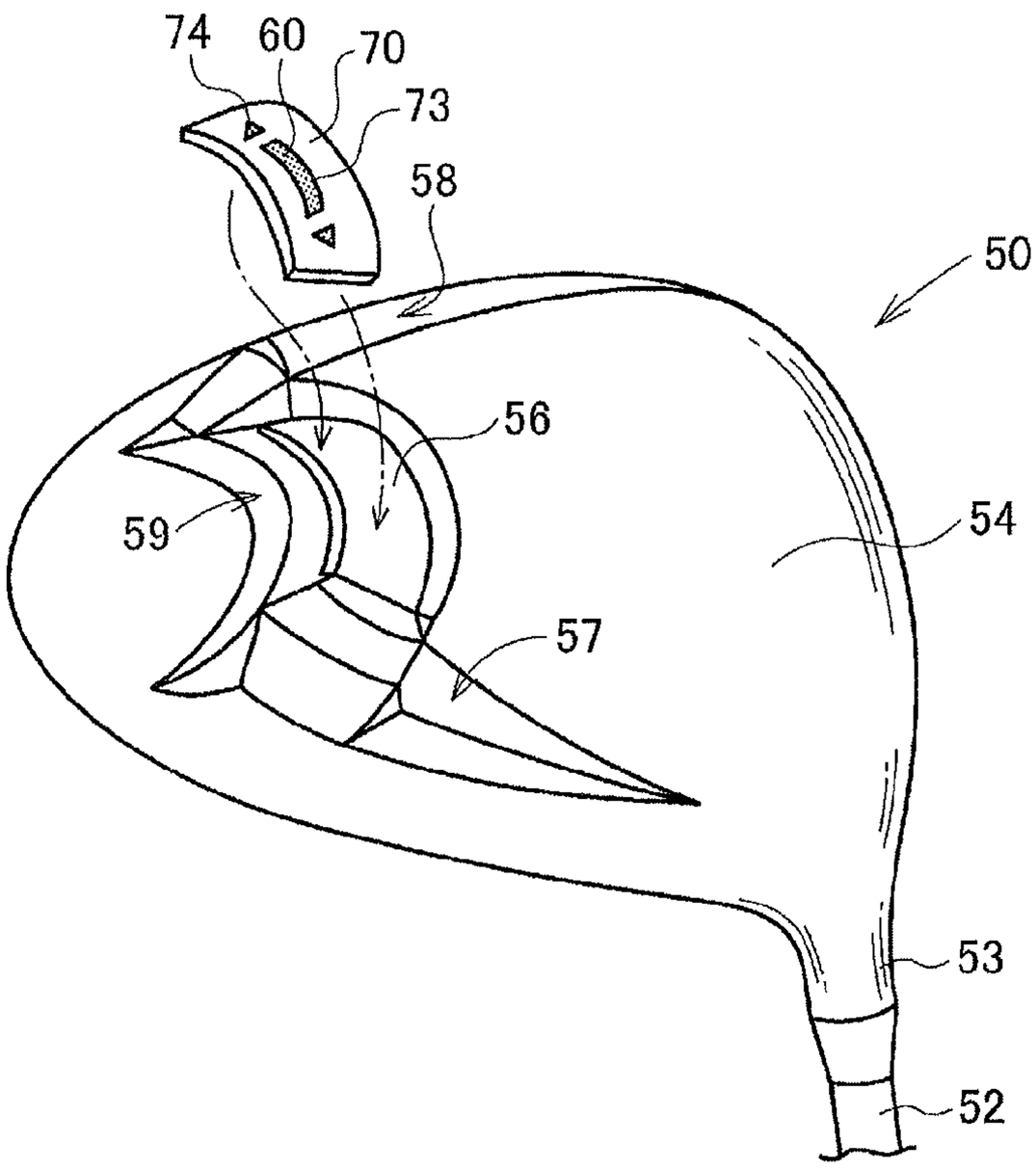


FIG.12

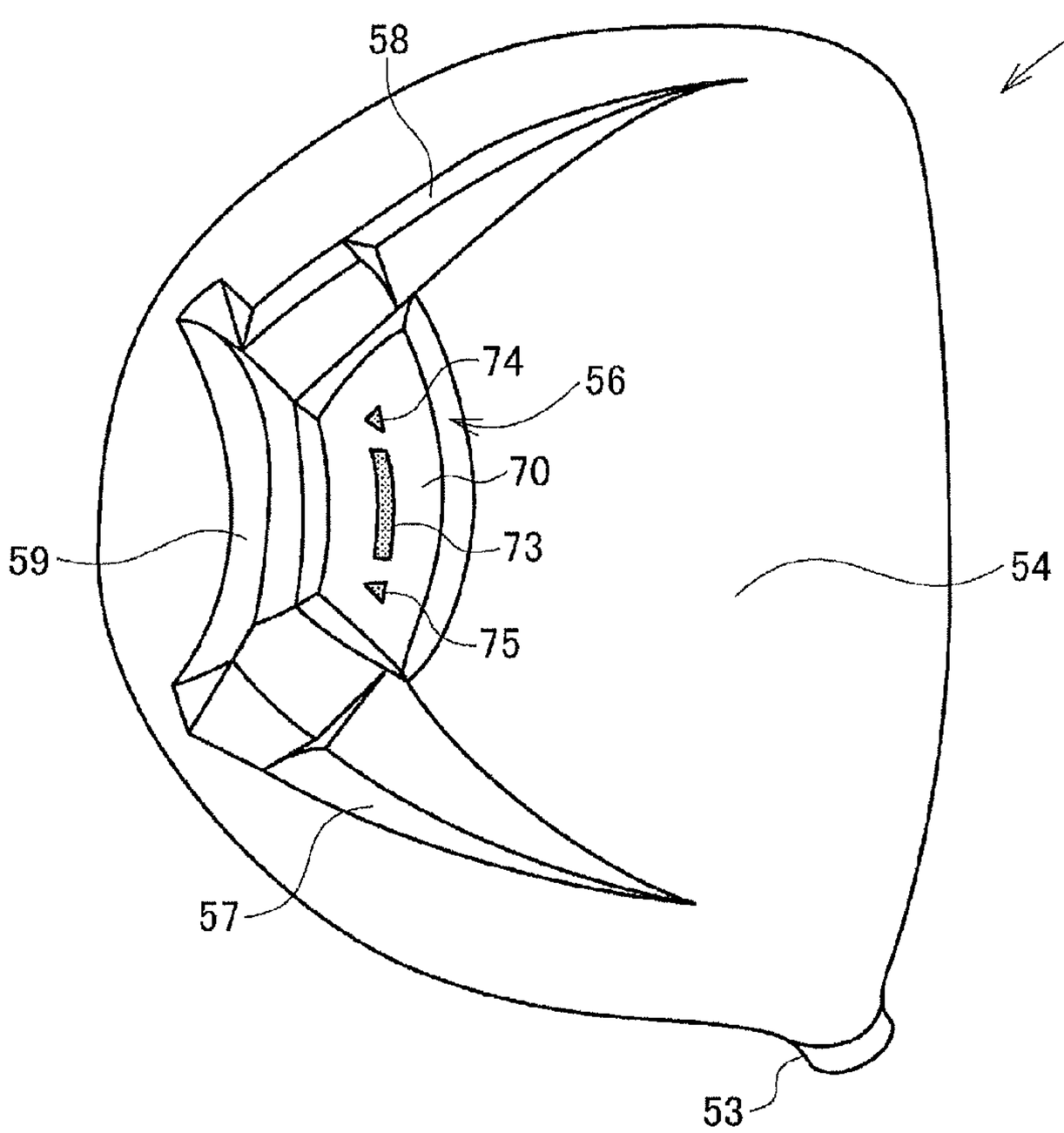


FIG.13

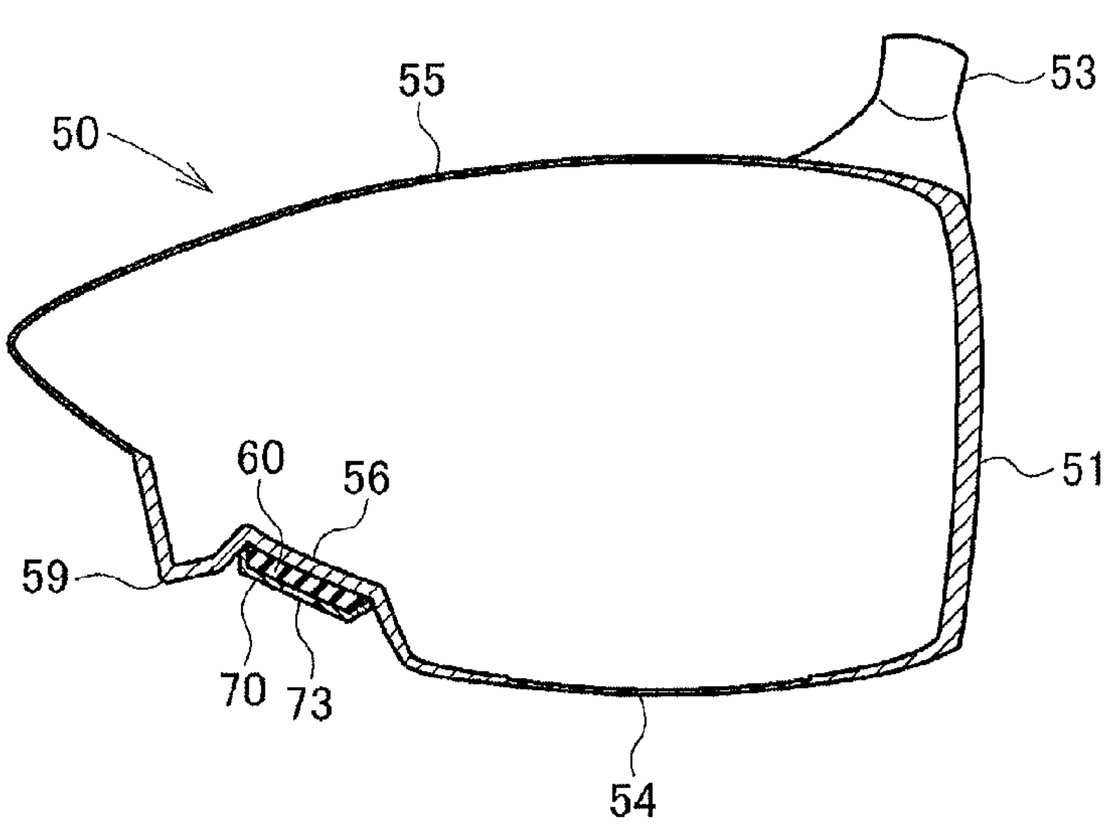


FIG.14

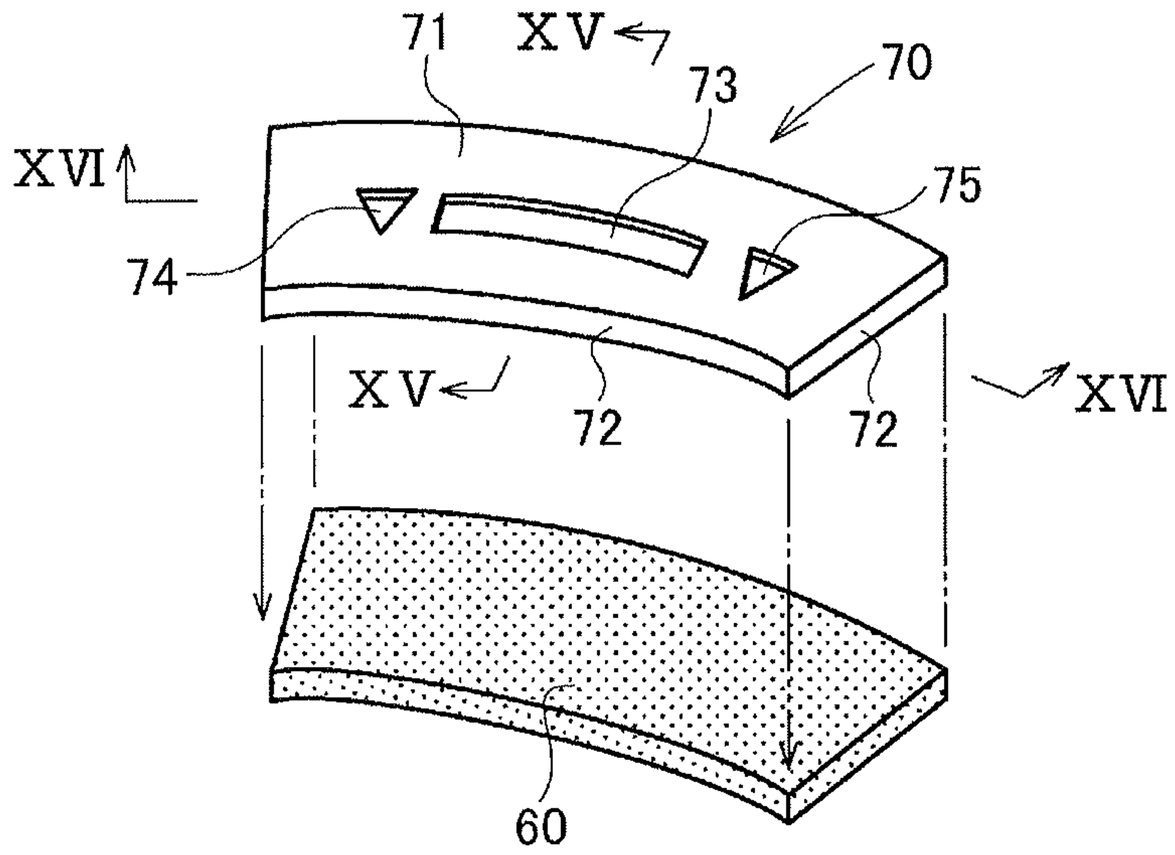


FIG.15

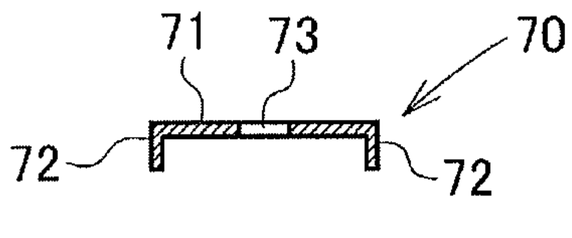
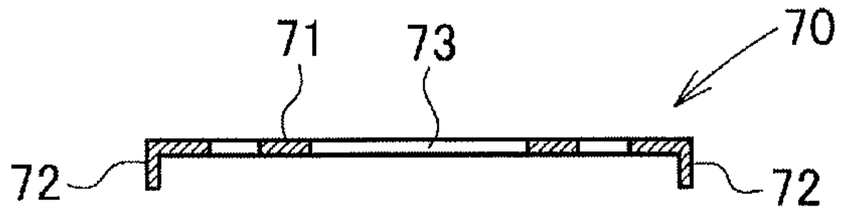


FIG.16



GOLF CLUB HEAD

CROSS-REFERENCE TO RELATED APPLICATION

The present application claims the right of priority of Japanese Patent Applications Nos. 2011-156672 and 2011-156673 filed on Jul. 15, 2011, which form a part of this specification, by citing these applications herein.

BACKGROUND OF THE INVENTION

The present invention relates to a golf club head. More particularly, the present invention relates to an iron-type golf club head in which a viscoelastic body is adherently disposed on the back face of a face plate part. Still more particularly, the present invention relates to a golf club head in which a viscoelastic body is made to adhere to a part of the outer face thereof, and a cover plate is provided so as to cover the viscoelastic body.

The iron-type golf club head includes at least a face plate part for hitting a ball, a sole part, and a hosel part. The golf club is formed by inserting and fixing a shaft in the hosel part.

To absorb a shock or vibrations occurring on the golf club head when a ball is hit by using the golf club, in some cases, a viscoelastic material such as rubber is made to adhere onto the golf club head, or is incorporated in a void of the golf club head.

JP 06-510689 T describes a golf club head in which an elliptical viscoelastic body that is made of butyl rubber or the like and has a major axis of 45 mm, a minor axis of 18 mm, and a thickness of 1 mm is bonded onto the back face of the face plate part, and also a 1-mm thick nameplate made of an aluminum-zinc-magnesium alloy is bonded onto the viscoelastic body.

This patent Document describes that the viscoelastic plate and the hard plate have the same size. Therefore, the whole of the end face of the viscoelastic plate is exposed to the atmospheric air, so that the viscoelastic plate is liable to be deteriorated by moisture or ultraviolet rays, or to peel off the back face of the face plate part. Also, since the viscoelastic plate absorbs vibrations propagating from the face plate part side only, the vibration absorbing action of the viscoelastic plate is sometimes insufficient.

To solve the above-described problems, JP 2011-30837 A discloses a golf club head of an iron type in which the durability of adhesion of the viscoelastic plate to the face plate part is excellent and which has a face plate part for hitting a ball, a sole part, and a hosel part for connecting a shaft thereto as a golf club head that has superior vibration absorbing effects. In this golf club head, a viscoelastic body is made to adhere to the back face of the face plate part, and a nameplate lapping over the viscoelastic body is provided, and it is characterized in that the nameplate has an expanding part expanding to the surroundings of the viscoelastic body, and the expanding part is made to adhere to the back face of the face plate part.

For the golf club head disclosed in this patent Document, the viscoelastic body is made to adhere to the back face of the face plate part, and further, the nameplate is provided so as to cover the viscoelastic body. The nameplate has the expanding part expanding to the surroundings of the viscoelastic body, and the expanding part is made to adhere to the back face of the face plate part. Therefore, the viscoelastic body is covered with the nameplate in an enclosed form, and is not exposed to the atmospheric air. For this reason, the viscoelastic body is not splashed with water, nor is it irradiated directly by ultraviolet rays, so that the durability of the viscoelastic body and the durability of adhesion of the viscoelastic body to the back face of the face plate part are excellent.

Also, in this patent Document, since the expanding part of the nameplate is made to adhere to the face plate part, some of the vibrations occurring in the peripheral edge portion of the face plate part at the ball hitting time (shot time) propagates to the viscoelastic body via the nameplate and is absorbed by the viscoelastic plate.

SUMMARY OF THE INVENTION

In JP 2011-30837 A described above, since the viscoelastic body is provided only in a central portion of the back face of the face plate part, there is some room for improvement in the vibration absorbing effects.

An object of the present invention is to provide a golf club head that has excellent vibration absorbing effects.

Another object of the present invention is to provide a golf club head that has excellent durability of adhesion of a viscoelastic plate to a face plate part and excellent vibration absorbing effects.

The present invention provides, as one mode thereof, a golf club head, which is of an iron type, including a face plate part for hitting a ball, which has a cavity part on the back side thereof; a sole part; a hosel part for connecting the head to a shaft; a viscoelastic body made to adhere to the back face of the face plate part, the viscoelastic body including a board-shaped part located on the back face of a central portion of the face plate part and extending parts extending from the board-shaped part to the toe side and the heel side of the head; and a cover plate (or a nameplate) lapping over the viscoelastic body, the cover plate including a concavity for accommodating the board-shaped part of the viscoelastic body and concave lines for accommodating the extending parts of the viscoelastic body.

The tip end faces of the extending parts of the viscoelastic body may be covered with a wall part formed in the peripheral edge portion of the cover plate.

The viscoelastic body and the cover plate may be affixed to the back face of the face plate part with an adhesive or a gluing agent.

The cover plate may be formed of a metal having a thickness of 0.2 to 0.4 mm.

The sole part may include mountain parts, which are convex from the face of the sole part on the cavity part side toward the substantially vertical direction on the toe side and the heel side thereof, and valley parts, which are located between the mountain parts; and the surface connecting the top portions of the mountain parts with the back face of the face plate part may be inclined toward the sole part with respect to the outer side surface of the sole part. In this case, the distance between the lowermost edge of the back face of the face plate part and the outer side surface of the sole part may increase gradually from the center part toward the toe side and the heel side.

According to this mode of the present invention, the viscoelastic body is made to adhere to the back face of the face plate part, and further the cover plate is provided so as to cover the viscoelastic body. The cover plate has the concavity in the central portion and concave lines extending from the concavity, the viscoelastic body is disposed in the concavity and concave lines, and the end face of the viscoelastic body is not at all exposed or is scarcely exposed to the atmospheric air. Therefore, the viscoelastic body is not splashed with water, nor is it irradiated directly by ultraviolet rays, so that the durability of the viscoelastic body and the durability of adhesion of the viscoelastic body to the back face of the face plate part are excellent.

According to this mode of the present invention, some of the vibrations occurring in the peripheral edge portion of the face plate part at the ball hitting time (shot time) propagates to the viscoelastic body via the cover plate and is absorbed by the viscoelastic plate. Therefore, the vibration absorbing effect is excellent.

According to this mode of the present invention, the viscoelastic body is provided with the extending parts on the toe side and the heel side. Therefore, the vibrations at the time when a ball is hit by the toe side or the heel side of the face plate part are immediately absorbed by the extending part located just close to the hit portion, so that the vibration absorbing effect is high. The vibrations at the time when a ball is hit by a portion that does not lap over the board-shaped part and the extending parts of the face surface (for example, an upper portion or a lower portion on the toe side or an upper portion or a lower portion on the heel side of the face surface) propagate to the viscoelastic body via not only the face plate part but also the flat portion (the portion excluding the concavity and the concave lines) of the cover plate and are absorbed by the viscoelastic body.

According to this mode of the present invention, the distance between the lowermost edge of the back face of the face plate part and the outer side surface of the sole part is increased gradually from the center part toward the toe side and the heel side, and therefore the cover plate exists down to the vicinity of the sole part, so that the area of the cover plate is large. For this reason, the vibrations at the time when a ball is hit by a lower portion on the toe side or the heel side of the face surface propagate easily to the viscoelastic body via the cover plate, so that the vibration absorbing effect is achieved.

The present invention provides, as another mode, a golf club head including a viscoelastic body made to adhere to at least one portion of the outer side surface of the golf club head; and a cover plate lapping over the viscoelastic body, the cover plate having an opening, and a part of the viscoelastic body being exposed through the opening.

The golf club head may be of an iron type; the golf club head may include a face plate part for hitting a ball; and the viscoelastic body and the cover plate may be disposed on the back face of the face plate part.

Also, the golf club head may be of a wood type; the golf club head may include a sole part; and the viscoelastic body and the cover plate may be disposed in a depressed part provided in the sole part.

The cover plate may be formed of a metal having a thickness of 0.2 to 0.4 mm.

Of the viscoelastic body, a portion exposed through the opening may protrude through the opening. In this case, of the viscoelastic body, the portion exposed through the opening may have a thickness changing partially.

According to this mode of the present invention, the viscoelastic body is made to adhere to a part of the outer surface of the golf club head, and further the cover plate is provided so as to cover the viscoelastic body. The opening is formed in a part of the cover plate, and a part of the viscoelastic body is exposed through the opening. Some of vibrations occurring when a ball is hit by this golf club head is absorbed by the viscoelastic body. A part of the viscoelastic body is exposed through the opening in the cover plate, and the exposed part of the viscoelastic body vibrates without being restrained by the cover plate and absorbs the vibrations, so that the vibration absorbing effect is excellent.

The portion of the viscoelastic body exposed through the opening has a thickness changing partially. Thereby, vibrations in a wide frequency zone are absorbed efficiently.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of one embodiment of a golf club head in accordance with the present invention, as viewed from the sole side of the rear face side thereof.

FIG. **2** is an exploded perspective view of the golf club head shown in FIG. **1**.

FIG. **3** is a sectional view taken along the line III-III of FIG. **1**.

FIG. **4** is an exploded view of FIG. **3**.

FIG. **5** is a sectional view taken along the line V-V of FIG. **1**.

FIG. **6** is a sectional view taken along the line VI-VI of FIG. **1**.

FIG. **7** is a sectional view taken along the line VII-VII of FIG. **2**, showing a cover plate and a viscoelastic body.

FIG. **8** is a sectional view of the back face of a face plate part.

FIG. **9** is a sectional view taken along the line IX-IX of FIG. **3**.

FIG. **10** is a perspective view of a wood-type golf club head in accordance with another embodiment, as viewed from the sole side thereof.

FIG. **11** is an exploded view of the golf club head shown in FIG. **10**.

FIG. **12** is a bottom view of the golf club head shown in FIG. **10**.

FIG. **13** is a longitudinal sectional view of the golf club head shown in FIG. **10**.

FIG. **14** is a perspective view of a viscoelastic body and a cover plate.

FIG. **15** is a sectional view taken along the line XV-XV of FIG. **14**.

FIG. **16** is a sectional view taken along the line XVI-XVI of FIG. **14**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first embodiment of a golf club head in accordance with the present invention will now be described with reference to FIGS. **1** to **9**.

An iron-type golf club head **1** of the first embodiment is attached to the tip end of a shaft **2**, and includes a golf club head body **10**, a viscoelastic body **20** made to adhere to the back face of a face plate part **11** of the golf club head body **10**, and a cover plate **30** that covers the viscoelastic body **20** and is made to adhere to the back face of the face plate part **11**.

The golf club head body **10** has the face plate part **11**, a hosel part **12**, and a sole part **13**. The rear surface side of the face plate part **11** forms a cavity part **14**. The cavity part **14** extends from the toe side to the heel side (player side), and the periphery thereof is surrounded by a toe-side convex part **15**, a top-side convex part **16**, and a heel-side convex part **17**. These convex parts **15** to **17** rise from the peripheral edge of the face plate part **11** to the rear. The back face of the face plate part **11** is formed into a flat surface excluding the vicinities of the convex parts **15** to **17** and the sole part **13**.

The upper face portion of the sole part **13** consists of a toe-side mountain part **18**, a heel-side mountain part **19**, and a valley part **13***a* between the mountain parts **18** and **19**.

The height of the top portions of the mountain parts **18** and **19** from the sole face is 5 to 20 mm, especially 6 to 10 mm, larger than the height of the valley part **13***a* from the sole face.

The surfaces on the face plate part **11** side of the mountain parts **18** and **19** form inclined planes **18***a* and **19***a* having a downgrade toward the face plate part **11**. As shown in FIG. **9**,

the lowermost edge of the back face of the face plate part **11**, that is, a bottom part **14***a* of the cavity part **14** has a gentle downgrade from a toe side **14***t* and a heel side **14***h* to a center part (an intermediate portion in the toe-to-heel direction) **14***c*.

That is, the distance between the bottom part **14***a* and the sole face is the shortest in the center part **14***c*, and increases gradually from the center part **14***c* to the heel side **14***h* and the toe side **14***t*.

In this embodiment, the bottom face (sole face) on the toe side and the heel side of the sole part **13** is formed with concave holes **40** and **41** (FIG. **2**), respectively, and the inner portions of the concave holes **40** and **41** are filled with vibration absorbing materials **42** and **43** consisting of rubber or elastomer, respectively. The inlet portions of the concave holes **40** and **41** form enlarged portions each having an opening area larger than the area of the inner portions of the concave holes **40** and **41**, and in the enlarged portions of the concave holes **40** and **41**, weight materials **44** and **45** each consisting of a high-density metallic material having a specific gravity of 10 or more, preferably 12 or more, such as tungsten or tungsten alloy, are fitted, respectively. The weight materials **44** and **45** are fixed to the golf club head body **10** by laser welding, caulking, or the like means.

As a material for the vibration absorbing materials **42** and **43**, rubber in which butyl bromide rubber or chlorobutyl rubber is blended in natural rubber or the like, NBR (acrylonitrile-butadiene rubber), silicone rubber, styrene type elastomer, olefin type elastomer, urethane type elastomer, ester type elastomer, amide type elastomer, and the like are cited. Among these materials, NBR is best suitable.

As shown in FIGS. **2** to **4**, the viscoelastic body **20** has a substantially rhombic board-shaped part **21**, a toe-side extending part **22** extending from the board-shaped part **21** to the toe side, and a heel-side extending part **23** extending from the board-shaped part **21** to the heel side. In the center of the board-shaped part **21**, a first convex part **21***a* exists, and a first concave part **21***b* is provided so as to surround the first convex part **21***a*, a second convex part **21***c* is provided so as to surround the first concave part **21***b*, a second concave part **21***d* is provided so as to surround the second convex part **21***c*, a third convex part **21***e* is provided so as to surround the second concave part **21***d*, and a thin-plate part **21***f* at the outermost periphery is provided so as to surround the third convex part **21***e*.

The toe-side extending part **22** and the heel-side extending part **23** are connected to the upper portions of the board-shaped part **21**, and extend to the toe side and the heel side, respectively. The toe-side extending part **22** has a length reaching the toe side of the cover plate **30**. The heel-side extending part **23** has a length reaching the heel side of the cover plate **30**.

As a material for the viscoelastic body **20**, rubber or elastomer having viscoelasticity is suitable. As a suitable material of rubber or elastomer, the materials that are the same as the materials for the vibration absorbing materials **42** and **43** are cited, and among these materials, NBR is most suitable.

The average thickness of the board-shaped part **21** of the viscoelastic body **20** is preferably 0.5 to 2.5 mm, especially about 0.8 to 1.5 mm. The vertical length of the board-shaped part **21** is preferably 10 to 30 mm, especially about 18 to 28 mm, and the maximum horizontal width thereof is preferably 15 to 35 mm, especially about 20 to 30 mm.

The width (width in the direction perpendicular to the lengthwise direction) of each of the toe-side extending part **22** and the heel-side extending part **23** is preferably about 3 to 8 mm, and the average thickness thereof is preferably 0.2 to 2.0 mm, especially 0.5 to 1.5 mm.

The cover plate **30** has a size spreading throughout the whole of the back face of the face plate part **11**, that is, from the toe side to the heel side and from the top side to the sole side. In an intermediate potion in the toe-to-heel direction of the cover plate **30**, a concavity **31** having a shape and size corresponding to the shape and size of the viscoelastic body **20** is provided.

In the center of the concavity **31**, as shown in FIG. **4**, an opening **35**, into which the first convex part **21***a*, the first concave part **21***b*, and the second convex part **21***c* fit, is formed. Also, a concave line **36** with which the third convex part **21***e* engages is provided so as to surround the opening **35**.

In the cover plate **30**, a toe-side concave line **32** and a heel-side concave line **33** are provided so as to extend from the upper portions of the concavity **31** toward the toe side and the heel side, respectively. With the concave lines **32** and **33**, the toe-side extending part **22** and the heel-side extending part **23** of the viscoelastic body **20** engage, respectively. The concave lines **32** and **33** reach the peripheral edge portions of the cover plate **30**, and, as shown in FIGS. **7** and **8**, a wall part **34** for closing the concave lines **32** and **33** is provided in the peripheral edge portion of the cover plate **30**.

The toe-side concave line **32** is located near the intermediate portion in the up-and-down direction of the side edge portion on the toe side of the cover plate **30**, and the heel-side concave line **33** is located near the intermediate portion in the up-and-down direction of the side edge portion on the heel side of the cover plate **30**.

The cover plate **30** is flat excluding the concavity **31** and the concave lines **32** and **33**. In this flat portion, although not shown, an uneven pattern is provided so as to represent various letters, figures, and symbols.

In the state in which the viscoelastic body **20** engages with the concavity **31** and the concave lines **32** and **33**, the faces on the face plate part **11** side of the viscoelastic body **20** and the cover plate **30** are flush.

The cover plate **30** is preferably made of a metallic material having a thickness of 0.2 to 0.4 mm, especially about 0.3 mm.

The cover plate **30** is preferably manufactured by the electroforming method, which is a molding method to which the plating technology is applied, or the press molding method.

As a metal used when the cover plate **30** is manufactured by the electroforming method, copper, nickel, chromium, zinc, gold, silver, rhodium, nickel-phosphorus alloy, or the like is suitable, and nickel is especially suitable. When the cover plate **30** is manufactured by the electroforming method, it is preferable that the surface of a base material consisting of the above-described metal be plated with a metal harder than the metal used as the base material. For example, the surface of the base material consisting of nickel is preferably plated with chromium. This plating treatment makes the cover plate **30** less liable to be damaged. Also, the coloration of the base material may be changed by partial plating.

As a metal used when the cover plate **30** is manufactured by the press molding method, aluminum, aluminum alloy, titanium, or titanium alloy, each of which has good ductility, or stainless steel, which is less liable to rust, is suitable. Aluminum, aluminum alloy, titanium, and titanium alloy are preferably subjected to anodizing treatment.

The board-shaped part **21** and the extending parts **22** and **23** of the viscoelastic body **20** are engaged with the concavity **31** and concave lines **32** and **33** of the cover plate **30**, respectively, and this engaged member is affixed to the back face of the face plate part **11** with an adhesive or a gluing agent such as a double-faced adhesive tape.

The shaft is inserted in the hosel part **12** of the golf club head **1**, and is fixed to the hosel part **12** with an adhesive,

whereby a golf club (iron) is formed. The vibrations occurring when a ball is hit by using this iron are absorbed by the viscoelastic bodies **20**, **42** and **43**. Among these viscoelastic bodies, the viscoelastic body **20** has a large vibration absorption amount because it is positioned on the back face of the face plate part **11**. In the present invention, the opening **35** is formed in the cover plate **30** covering this viscoelastic body **20**, and a part (the convex parts **21***a* and **21***c* and the concave part **21***b* of the board-shaped part **21**) is exposed through the opening **35**. Therefore, the convex parts **21***a* and **21***c* and the concave part **21***b* vibrate without being restrained by the cover plate **30**, so that the vibration absorbing effect is excellent. Also, since the thickness of the board-shaped part **21** is different at the portions of the convex parts **21***a* and **21***c* and the concave part **21***b*, vibrations in a wide frequency range are absorbed efficiently.

That is, in the board-shaped part **21** of the viscoelastic body **20** used in this embodiment, the portions of the convex parts **21***a*, **21***c* and **21***e* are thick, and the portions of the concave parts **21***b* and **21***d* and the thin-plate part **21***f* are thin, so that vibrations in a wide frequency range can be absorbed effectively.

In this embodiment, the bottom portion of the back face of the face plate part **11** thrusts deep to the sole side throughout the whole zone ranging from the toe side to the heel side, and the lower edge of the cover plate **30** exists down to the vicinity of the sole part **13**, so that the area of the cover plate **30** is large. Therefore, the vibrations at the time when a ball is hit by a lower portion on the toe side or the heel side of the face surface propagate easily to the viscoelastic body **20** via the cover plate **30**, so that the vibration absorbing effect is excellent.

In this embodiment, the tip end faces of the extending parts **22** and **23** of the viscoelastic body **20** are covered with the wall part **34** of the cover plate **30**. Therefore, all of the end faces of the viscoelastic body **20** are covered with the cover plate **30** in an enclosed form, and are not exposed to the atmospheric air. For this reason, the adhesion surface of the viscoelastic body **20** and the back face of the face plate part **11** is not splashed with water, nor is it irradiated directly by ultraviolet rays, so that the durability of the viscoelastic body **20** and the durability of adhesion of the viscoelastic body **20** to the back face of the face plate part **11** are excellent. Since the areas of the tip end faces of the extending parts **22** and **23** are small, the durability of adhesion is scarcely affected even if the wall part **34** is omitted.

In this embodiment, the convex parts **21***a* and **21***c* and the concave part **21***b* of the board-shaped part **21** of the viscoelastic body **20** are exposed to the atmospheric air. However, even if these portions are splashed with water, this water does not go around to the adhesion surface of the viscoelastic body **20** and the face plate part **11**.

In this embodiment, the convex part **21***e* of the board-shaped part **21** of the viscoelastic body **20** fits snugly into the concavity **31** provided in the cover plate **30**, and the viscoelastic body **20** is held firmly on the back face of the face plate part **11**. Also, since the cover plate **30** is flat excluding the concavity **31** and the concave lines **32** and **33**, the cover plate **30** can be adherently held to the face plate part **11** firmly.

In this embodiment, since the viscoelastic body **20** is provided with the extending parts **22** and **23** on the toe side and the heel side, respectively, the vibrations at the time when a ball is hit by the toe side or the heel side of the face plate part **11** are immediately absorbed by the extending part **22** or **23** located just close to the hit portion, so that the vibration absorbing effect is high. The vibrations at the time when a ball is hit by a portion that does not lap over the board-shaped part **21** and the extending parts **22** and **23** of the face surface (for example, an upper portion or a lower portion on the toe side or an upper portion or a lower portion on the heel side of the face surface) propagate to the viscoelastic body **20** via not only the face plate part **11** but also the flat portion (the portion excluding the concavity **31** and the concave lines **32** and **33**) of the cover plate **30** and are absorbed by the viscoelastic body **20**.

In the present invention, the bottom portion of the back face of the face plate part **11** thrusts deep to the sole side throughout the whole zone ranging from the toe side to the heel side, and the lower edge of the cover plate **30** exists down to the vicinity of the sole part **13**, so that the area of the cover plate **30** is large. Therefore, the vibrations at the time when a ball is hit by a lower portion on the toe side or the heel side of the face surface propagate easily to the viscoelastic body **20** via the cover plate **30**, so that the vibration absorbing effect is excellent.

In the board-shaped part **21** of the viscoelastic body **20** used in this embodiment, the portions of the convex parts **21***a*, **21***c* and **21***e* are thick, and the portions of the concave parts **21***b* and **21***d* and the thin-plate part **21***f* are thin, so that vibrations having various frequencies can be absorbed effectively.

The adhesive or the gluing agent used for the adhesion of the viscoelastic body **20** and the cover plate **30** also achieves an effect of absorbing vibrations in the direction along the back face of the face plate part **11** (in-plane direction). The provision of the concavity **31**, the toe-side concave line **32**, and the heel-side concave line **33** in the cover plate **30** can enhance the rigidity of the cover plate **30** even if the cover plate **30** is thin. In particular, the provision of the toe-side concave line **32** and the heel-side concave line **33** can enhance the rigidity in the toe-to-heel direction of the cover plate **30**.

The above-described embodiment is one example of the present invention, and the present invention may adopt a mode other than illustrated. For example, the shapes of the viscoelastic body **20** and the cover plate **30** and the size and shape of the opening may be other than illustrated. Also, the configuration may be such that the opening **35** in the cover plate **30** is omitted, and the whole of the back face of the viscoelastic body **20** is covered with the cover plate **30**.

Hereunder, a second embodiment of the golf club head in accordance with the present invention is described with reference to FIGS. **10** to **16**. A wood-type golf club head **50** in the second embodiment is a driver wood; however, this golf club head **50** may be a wood of No. 2 or higher grade. Also, the present invention can be applied to a utility-type golf club head having a shape approximate to that of the wood-type golf club head.

The wood-type golf club head **50** is a hollow golf club head formed by using a raw material such as titanium alloy, stainless steel, or CFRP, and includes a face surface **51** for hitting a ball, a hosel part **53** for attaching a shaft **52**, a sole face **54**, and a crown part **55**. In a rear portion of the sole face **54**, a depressed part **56** is provided.

In this embodiment, the depressed part **56** is disposed in an intermediate portion in the toe-to-heel direction, and extends in the toe-to-heel direction. On the heel side and the toe side of the depressed part **56**, convex line parts **57** and **59** extending toward the face surface side are provided, respectively. Also, a convex line part **59** is provided along the rear edge of the depressed part **56**.

The depressed part **56** is composed of a rising surface rising from the sole face and a substantially flat bottom surface.

In the depressed part **56**, a viscoelastic body **60** is made to adhere to the bottom surface of the depressed part **56**, and a cover plate **70** is provided so as to cover the viscoelastic body

60. The viscoelastic body **60** has a flat plate shape and a size slightly smaller than the size of the bottom surface of the depressed part **56**.

As shown in FIGS. **14** and **15**, the cover plate **70** has a main surface part **71** lapping over the viscoelastic body **60**, a frame wall part **72** rising from the peripheral edge of the main surface part **71**, a slender and substantially rectangular first opening **73** formed in the main surface part **71**, and a second opening **74** and a third opening **75** that are adjacent to the first opening **73**. The first opening **73** extends in the toe-to-heel direction. The second opening **74** is located on the toe side of the first opening **73**, and the third opening **75** is located on the heel side of the first opening **73**. In this embodiment, the second opening **74** and the third opening **75** are of a triangular shape; however, they may be of a circular shape, an elliptical shape, a square shape, a polygonal shape, a star shape, or the like shape. Also, a fourth opening or more openings may be formed.

The viscoelastic body **60** is made to adhere to the bottom surface of the depressed part **56** with an adhesive or a gluing agent. The cover plate **70** is made to adhere to the viscoelastic body **60** with an adhesive or a gluing agent.

The shaft **52** is inserted in the hosel part **53** of the golf club head **50**, and is fixed to the hosel part **53** with an adhesive, whereby a golf club (wood) is formed.

The vibrations at the time when a ball is hit by using this head **50** are absorbed by the viscoelastic body **60**. Since the convex line parts **57** and **58** are provided on the sole face, the vibrations transmitted from the face surface **51** easily propagate to the depressed part **56** side, and is easily absorbed by the viscoelastic body **60**.

The openings **73** to **75** are formed in the cover plate **70** for covering viscoelastic body **60**, and a part of the viscoelastic body **60** is exposed through these openings **73** to **75**. Therefore, the viscoelastic body **60** is not restrained by the cover plate **70** in the portions of the openings **73** to **75**, so that the vibration absorbing effect is excellent.

The adhesive or the gluing agent used for the adhesion of the viscoelastic body **60** and the cover plate **70** also achieves an effect of absorbing vibrations in the sole face direction.

For the golf club head **50**, the viscoelastic body **60** is made to adhere to the bottom surface of the depressed part **56**, and further the cover plate **70** is provided so as to cover the viscoelastic body **60**. The end face of the viscoelastic body **60** is covered with the frame wall part **72** of the cover plate **70**. Therefore, all of the end faces of the viscoelastic body **60** are covered with the cover plate **70** in an enclosed form so as not be exposed to the atmospheric air. For this reason, the adhesion surface of the viscoelastic body **60** and the bottom surface of the depressed part **56** is not splashed with water, nor is it irradiated directly by ultraviolet rays, so that the durability of the viscoelastic body **60** and the durability of adhesion of the viscoelastic body **60** are excellent.

In this embodiment, a part of the viscoelastic body **60** is exposed to the atmospheric air via the openings **73**, **74** and **75**. However, even if these portions are splashed with water, this water does not go around to the adhesion surface of the viscoelastic body **60** and the bottom surface of the depressed part **56**.

The above-described embodiment is one example of the present invention, and the present invention may adopt a mode other than shown. For example, the shapes of the viscoelastic body **60** and the cover plate **70** and the sizes and shapes of the openings may be other than shown.

What is claimed is:

1. A golf club head, which is of an iron type, comprising:

a face plate part for hitting a ball, which has a cavity part on the back side thereof;

a sole part;

a hosel part for connecting the head to a shaft;

a viscoelastic body made to adhere to the back face of the face plate part, the viscoelastic body comprising a board-shaped part located on the back face of a central portion of the face plate part and extending parts extending from the board-shaped part to the toe side and the heel side of the head; and

a cover plate lapping over the viscoelastic body, the cover plate comprising a concavity for accommodating the board-shaped part of the viscoelastic body and concave lines for accommodating the extending parts of the viscoelastic body.

2. The golf club head according to claim **1**, wherein the tip end faces of the extending parts of the viscoelastic body are covered with a wall part formed in the peripheral edge portion of the cover plate.

3. The golf club head according to claim **1**, wherein the viscoelastic body and the cover plate are affixed to the back face of the face plate part with an adhesive or a gluing agent.

4. The golf club head according to claim **1**, wherein the cover plate is formed of a metal having a thickness of 0.2 to 0.4 mm.

5. The golf club head according to claim **1**, wherein

the sole part comprises mountain parts, which are convex from the face of the sole part on the cavity part side toward the substantially vertical direction on the toe side and the heel side thereof, and valley parts, which are located between the mountain parts; and

the surface connecting the top portions of the mountain parts with the back face of the face plate part is inclined toward the sole part with respect to the outer side surface of the sole part.

6. The golf club head according to claim **5**, wherein the distance between the lowermost edge of the back face of the face plate part and the outer side surface of the sole part increases gradually from the center part toward the toe side and the heel side.

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